WHAT IS CLAIMED IS:

1. An exhaust ring mechanism that contacts with a plasma region to subject an object to be processed to plasma processing in a processing chamber and provides an exhaust passage for process gas in the plasma region, the exhaust ring mechanism comprising:

an exhaust ring having a surface contacting with the plasma region; and

a magnetic field forming section which forms a magnetic field having a line of magnetic force substantially parallel to the direction of the surface of the exhaust ring.

2. The exhaust ring mechanism according to claim 1, wherein the magnetic field forming section is formed so that at least part of the line of magnetic force passes the inside of the exhaust ring.

3. The exhaust ring mechanism according to claim 1, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner periphery and an outer periphery on the surface of the exhaust ring.

4. The exhaust ring mechanism according to claim 2, wherein the magnetic field forming section is configured of magnets or electromagnets disposed along an inner periphery and an outer periphery on the surface of the exhaust ring.

5. The exhaust ring mechanism according to

claim 1, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner peripheral edge and an outer peripheral edge on the lower surface of the exhaust ring.

6. The exhaust ring mechanism according to claim 2, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner peripheral edge and an outer peripheral edge on the lower surface of the exhaust ring.

7. The exhaust ring mechanism according to claim 1, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction in the exhaust ring.

8. The exhaust ring mechanism according to claim 2, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction in the exhaust ring.

9. The exhaust ring mechanism according to claim 1, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined

interval in the peripheral direction at the lower surface side of the exhaust ring.

10. The exhaust ring mechanism according to claim 2, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction at the lower surface side of the exhaust ring.

11. The exhaust ring mechanism according to claim 1, wherein the exhaust ring mechanism has a magnetic field sealing section.

12. The exhaust ring mechanism according to claim 11, wherein the magnetic field sealing section is composed of a magnetic element.

13. A plasma processing apparatus for processing an object to be processed by plasma, comprising:

a holder which is disposed in a processing chamber and holds the object to be processed; and

an exhaust ring mechanism disposed between the holder and the processing chamber and having:

exhaust holes,

an exhaust ring having a surface contacting with the plasma region; and

a magnetic field forming section which forms a magnetic field having a line of magnetic force substantially parallel to the direction of the surface of the exhaust ring.

14. The plasma processing apparatus according to claim 13, wherein the magnetic field forming section is formed so that at least part of the line of magnetic force passes the inside of the exhaust ring.

15. The plasma processing apparatus according to claim 13, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner periphery and an outer periphery on the surface of the exhaust ring.

16. The plasma processing apparatus according to claim 14, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner periphery and an outer periphery on the surface of the exhaust ring.

17. The plasma processing apparatus according to claim 13, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner peripheral edge and an outer peripheral edge on the lower surface of the exhaust ring.

18. The plasma processing apparatus according to claim 14, wherein the magnetic field forming section is configured of a plurality of magnets or electromagnets disposed along an inner peripheral edge and an outer peripheral edge on the lower surface of the exhaust ring.

19. The plasma processing apparatus according to

claim 13, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction in the exhaust ring.

20. The plasma processing apparatus according to claim 14, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction in the exhaust ring.

21. The plasma processing apparatus according to claim 13, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction in the exhaust ring.

22. The plasma processing apparatus according to claim 14, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed radially at a predetermined interval in the peripheral direction at the lower surface side of the exhaust ring.

23. The plasma processing apparatus according to claim 13, wherein the exhaust ring mechanism has a magnetic field sealing section.

24. The plasma processing apparatus according to

claim 23, wherein the magnetic field sealing section is composed of a magnetic element.

25. A deposit shield mechanism that is in a processing chamber to protect an inner wall of the processing chamber and is in contact with a plasma region where an object to be processed is subjected to plasma processing and with an exhaust passage of process gas in the plasma region, the deposit shield mechanism comprising:

a magnetic field forming section which forms, at the end that is in contact with the plasma region, a magnetic field having a line of magnetic force substantially parallel to the direction of an electrode surface which forms the plasma.

26. The deposit shield mechanism according to claim 25, wherein the magnetic field forming section is formed so that at least part of the line of magnetic force passes the upper part of the deposit shield.

27. The deposit shield mechanism according to claim 25, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of electromagnets disposed along an inner periphery and an outer peripheral edge provided in the upper part of the deposit shield.

28. The deposit shield mechanism according to claim 26, wherein the magnetic field forming section is configured of a plurality of magnets or a plurality of

electromagnets disposed at a predetermined interval in the peripheral direction in the upper part of the deposit shield.

29. A plasma processing apparatus comprising:

a plasma processing chamber;

a susceptor which is disposed in the plasma processing chamber and on which a substrate to be processed is mounted;

an exhaust mechanism which exhausts the plasma processing chamber from beneath the susceptor; and

an exhausts ring having a plurality of exhaust holes that are formed in an annular shape to surround the susceptor, are different in the opening area, and are arranged so that the opening area of the exhaust holes disposed at the outer side of the exhaust ring is larger than the opening area of the exhaust holes disposed at the inner side of the exhaust ring.

30. The plasma processing apparatus according to claim 29, wherein at least three types of exhaust holes differing in the opening area are disposed in the exhaust ring so that the opening area is gradually increased from the inner side to the outer side of the exhaust ring.

31. The plasma processing apparatus according to claim 29, wherein the exhaust ring is varied in the plate thickness in gradual steps concentrically depending on the opening area of the exhaust holes.

32. The plasma processing apparatus according to claim 29, wherein a magnet to prevent leak of the plasma generated in the plasma processing chamber is provided at the exhaust ring.

33. The plasma processing apparatus according to claim 32, wherein the magnet is disposed in a plurality at an equal interval along the peripheral direction so that magnetic poles of the magnets are arranged along the peripheral direction of the exhaust ring.

34. The plasma processing apparatus according to claim 29, wherein the exhaust holes are circular holes, and the diameter of the exhaust holes of the largest opening area disposed at the outermost side is 5 to 20 mm.

35. The plasma processing apparatus according to claim 29, wherein a plasma is generated in the vacuum processing chamber, and the substrate is processed by etching.

36. An exhaust ring mechanism disposed in a plasma processing chamber of a plasma processing apparatus, formed in an annular shape to surround a susceptor on which a substrate to be processed is mounted, and having a plurality of exhaust holes that are provided in plural types different in the opening area and are arranged so that the opening area of the exhaust holes disposed at the outer side is larger than the opening area of the exhaust holes disposed at the inner side.

37. The exhaust ring mechanism according to claim 36, wherein at least three types of exhaust holes differing in the opening area are disposed so that the opening area is gradually increased from the inner side to the outer side.

38. The exhaust ring mechanism according to claim 36, wherein the plate thickness is varied in gradual steps concentrically depending on the opening area of the exhaust holes.

39. The exhaust ring mechanism according to claim 36, wherein a magnet to prevent leak of the plasma generated in the plasma processing chamber is provided.

40. The exhaust ring mechanism according to claim 39, wherein the magnet is disposed in a plurality at an equal interval along the peripheral direction so that magnetic poles of the magnets are arranged along the peripheral direction of the magnetic ring.

41. The exhaust ring mechanism according to claim 36, wherein the exhaust holes are circular holes, and the diameter of the exhaust holes of the largest opening area disposed at the outermost side is 5 to 20 mm.